Cost Saving Surface Preparation Process for Maintenance Painting

Pete Ault (KTA-Tator)

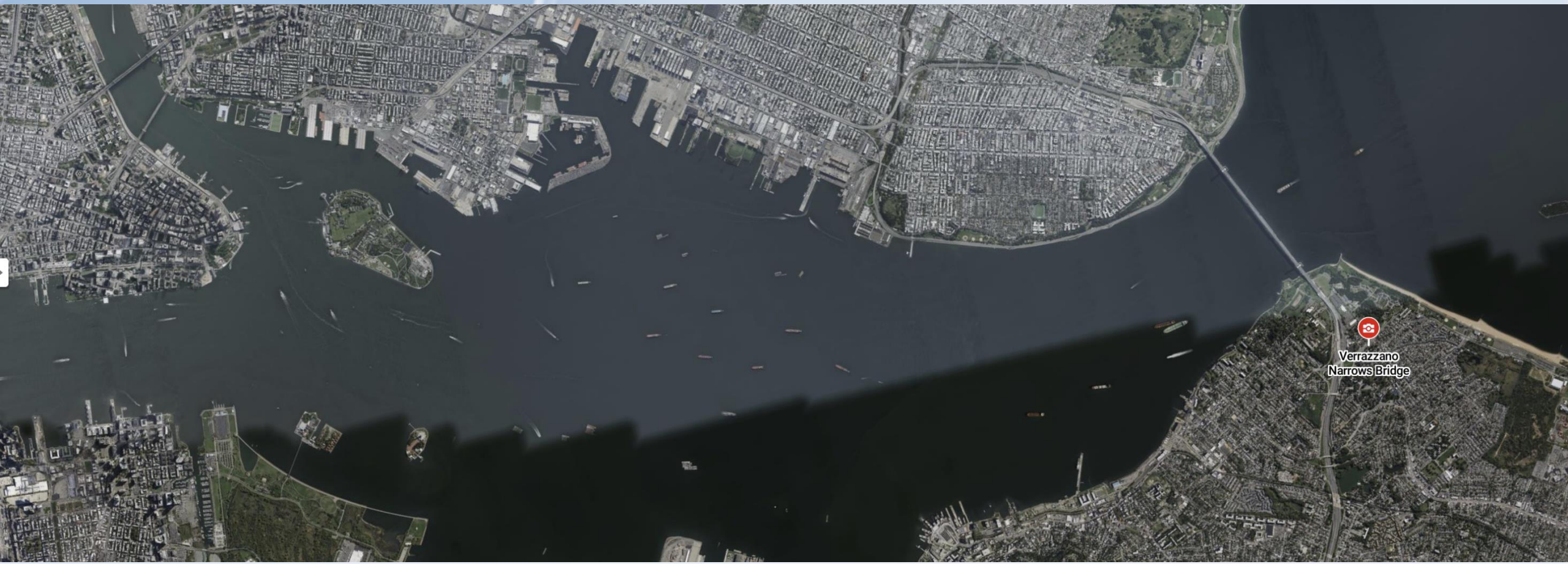
Eric Shoyer (KTA-Tator)

Pete McDonagh (MTA Construction and Development)

Brian Prazenka (MTA Construction and Development)

NATIONAL BRIDGE PRESERVATION CONFERENCE 2024
Innovation for Infrastructure Resiliency

Verrazzano-Narrows Bridge



Verrazzano-Narrows Bridge

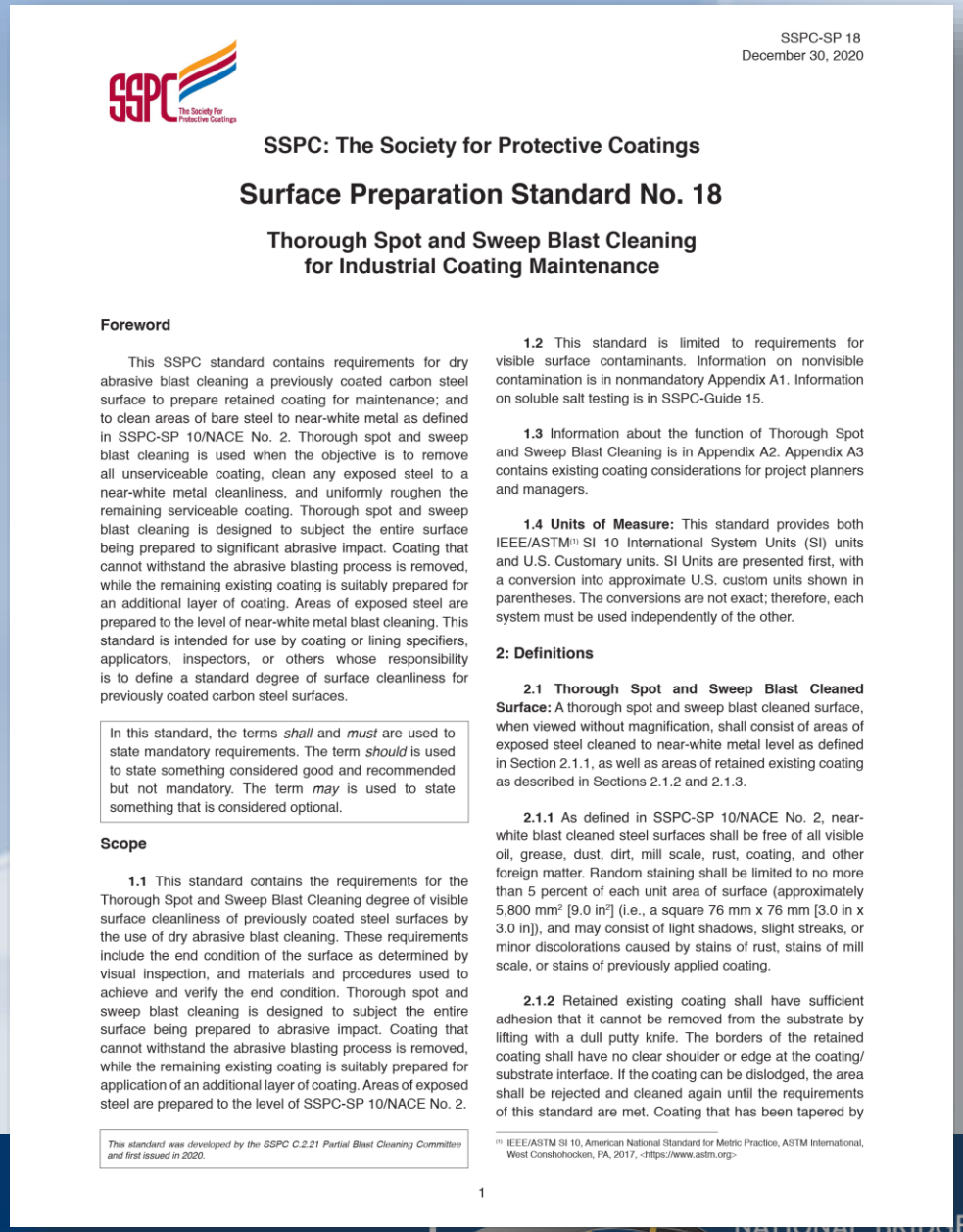
- Maintained by MTA Bridges and Tunnels
- Carries 13 lanes of traffic between Staten Island and Brooklyn
- 13,700 feet long, 103 feet wide, 693 feet tall
- Construction started in 1959, fully opened in 1969
- 11.5 million square feet of painted steel

Existing Condition beneath the Lower Level

- Approx 3 million square feet
- 1998-2002 – Existing lead removed and replaced with Organic Zinc/Epoxy/Poly-urethane
- 2020 – Isolated areas of breakdown observed & structural steel repairs needed
  - Typical painting options would be spot power tool prep/paint and removal/replacement

Existing Condition beneath the Lower Level

- Approx 3 million square fe
- 1999 – Existing lead remov and replaced with Organic Zinc/Epoxy/Polyurethane
- 2020 – Isolated areas of breakdown observed & structural steel repairs needed
  - Typical painting options wo be spot power tool prep/pa and removal/replacement



SSPC: The Society for Protective Coatings

Surface Preparation Standard No. 18

Thorough Spot and Sweep Blast Cleaning for Industrial Coating Maintenance

Foreword

This SSPC standard contains requirements for dry abrasive blast cleaning a previously coated carbon steel surface to prepare retained coating for maintenance; and to clean areas of bare steel to near-white metal as defined in SSPC-SP 10/NACE No. 2. Thorough spot and sweep blast cleaning is used when the objective is to remove all unserviceable coating, clean any exposed steel to a near-white metal cleanliness, and uniformly roughen the remaining serviceable coating. Thorough spot and sweep blast cleaning is designed to subject the entire surface being prepared to significant abrasive impact. Coating that cannot withstand the abrasive blasting process is removed, while the remaining existing coating is suitably prepared for an additional layer of coating. Areas of exposed steel are prepared to the level of near-white metal blast cleaning. This standard is intended for use by coating or lining specifiers, applicators, inspectors, or others whose responsibility is to define a standard degree of surface cleanliness for previously coated carbon steel surfaces.

In this standard, the terms *shall* and *must* are used to state mandatory requirements. The term *should* is used to state something considered good and recommended but not mandatory. The term *may* is used to state something that is considered optional.

Scope

1.1 This standard contains the requirements for the Thorough Spot and Sweep Blast Cleaning degree of visible surface cleanliness of previously coated steel surfaces by the use of dry abrasive blast cleaning. These requirements include the end condition of the surface as determined by visual inspection, and materials and procedures used to achieve and verify the end condition. Thorough spot and sweep blast cleaning is designed to subject the entire surface being prepared to abrasive impact. Coating that cannot withstand the abrasive blasting process is removed, while the remaining existing coating is suitably prepared for application of an additional layer of coating. Areas of exposed steel are prepared to the level of SSPC-SP 10/NACE No. 2.

This standard was developed by the SSPC C.2.21 Partial Blast Cleaning Committee and first issued in 2020.

1.2 This standard is limited to requirements for visible surface contaminants. Information on nonvisible contamination is in nonmandatory Appendix A1. Information on soluble salt testing is in SSPC-Guide 15.

1.3 Information about the function of Thorough Spot and Sweep Blast Cleaning is in Appendix A2. Appendix A3 contains existing coating considerations for project planners and managers.

1.4 Units of Measure: This standard provides both IEEE/ASTM[1] SI 10 International System Units (SI) units and U.S. Customary units. SI Units are presented first, with a conversion into approximate U.S. custom units shown in parentheses. The conversions are not exact; therefore, each system must be used independently of the other.

2: Definitions

2.1 Thorough Spot and Sweep Blast Cleaned Surface: A thorough spot and sweep blast cleaned surface, when viewed without magnification, shall consist of areas of exposed steel cleaned to near-white metal level as defined in Section 2.1.1, as well as areas of retained existing coating as described in Sections 2.1.2 and 2.1.3.

2.1.1 As defined in SSPC-SP 10/NACE No. 2, near-white blast cleaned steel surfaces shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, and other foreign matter. Random staining shall be limited to no more than 5 percent of each unit area of surface (approximately 5,800 mm^2 [9.0 in^2] (i.e., a square 76 mm x 76 mm [3.0 in x 3.0 in]), and may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coating.

2.1.2 Retained existing coating shall have sufficient adhesion that it cannot be removed from the substrate by lifting with a dull putty knife. The borders of the retained coating shall have no clear shoulder or edge at the coating/substrate interface. If the coating can be dislodged, the area shall be rejected and cleaned again until the requirements of this standard are met. Coating that has been tapered by

[1] IEEE/ASTM SI 10, American National Standard for Metric Practice, ASTM International, West Conshohocken, PA, 2017, <https://www.astm.org>

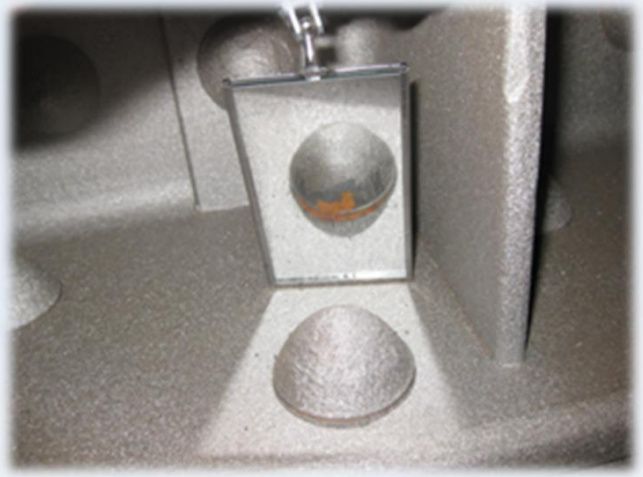
SSPC-SP 18

Thorough Spot and Sweep Blast Cleaning

December 2020

Why Thorough Spot and Sweep Blast Cleaning ?

- Why do we spend a disproportionate amount of surface preparation time removing intact paint from “difficult areas” and then spend a disproportionate amount of application time recoating those areas?



Why Does this Require a New Standard?

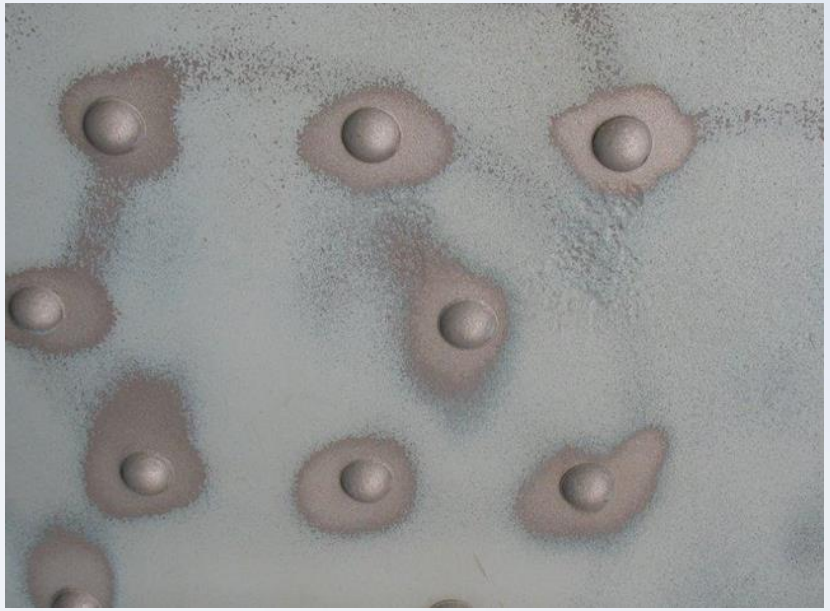
SP-7	Tightly adherent mill scale, rust, and coating may remain on the surface.
SP-14	Traces of tightly adherent mill scale, rust, and coating residues are permitted to remain on 10 percent of each unit area of the surface
???	*A gap exists that would require all rust to be removed but allow serviceable coating to remain.*
SP-6	Random staining shall be limited to no more than 33 percent of each unit area of surface
SP-10	Random staining shall be limited to no more than 5 percent of each unit area of surface
SP-5	Free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter.

Exposed Steel

- SSPC-SP 10/NACE No. 2, Near White Blast Cleaning
  - Free of all visible oil, grease, dust, dirt, mill scale, rust, coating, and other foreign matter.
  - Random staining limited to no more than 5 percent of each unit area of surface
  - May consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coating.

Retained Existing Coating

- Sufficient adhesion that it cannot be removed from the substrate by lifting with a dull putty knife
- If the coating can be dislodged, the area shall be rejected
- Borders shall have no clear shoulder or edge at the coating/substrate interface
- Coating that has been tapered by the blasting process in a manner that challenges adhesion and removes all sharp edges is well adhered
- No visible cracks, blisters, delamination, or other defects
- No chalking or residual corrosion staining
- Uniformly roughened
  - No area larger than 40 mm2 (~1/16 in)2 that exhibits the appearance of undisturbed coatings.



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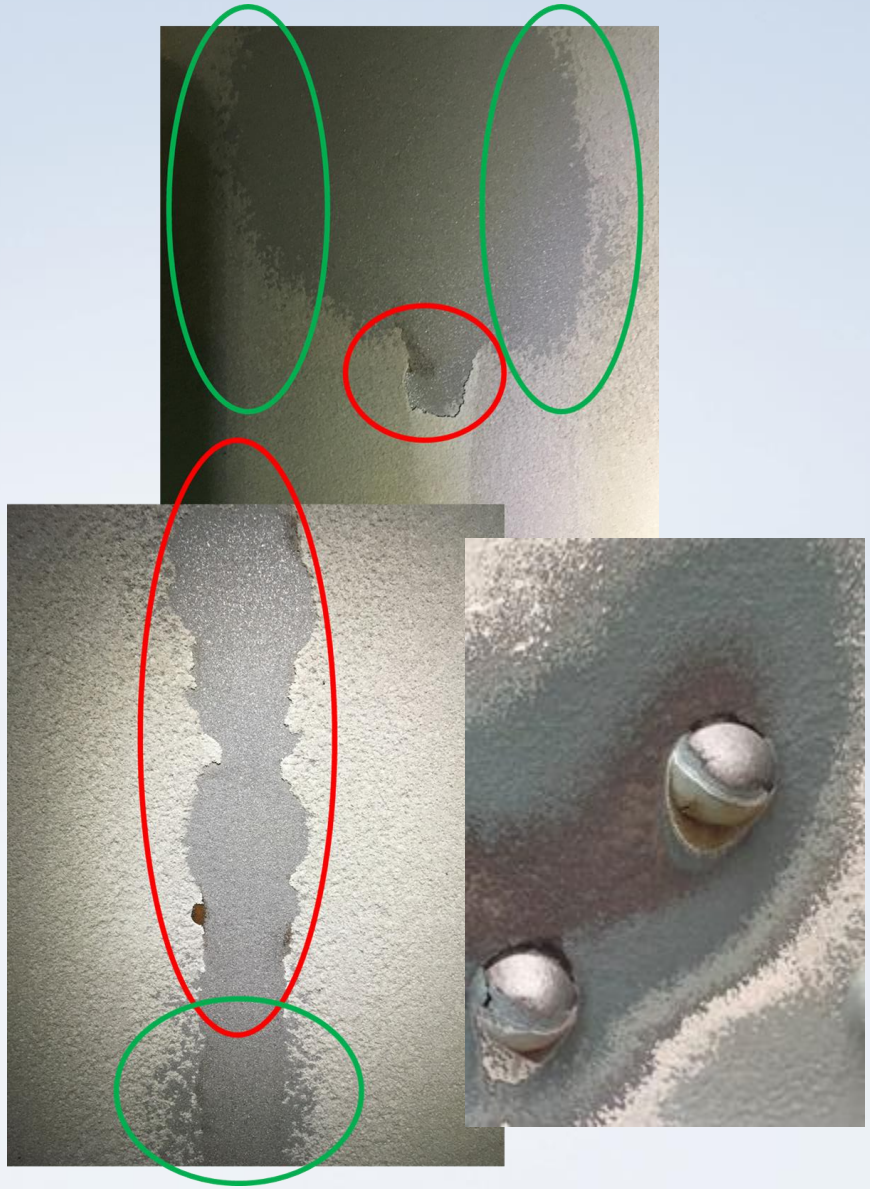

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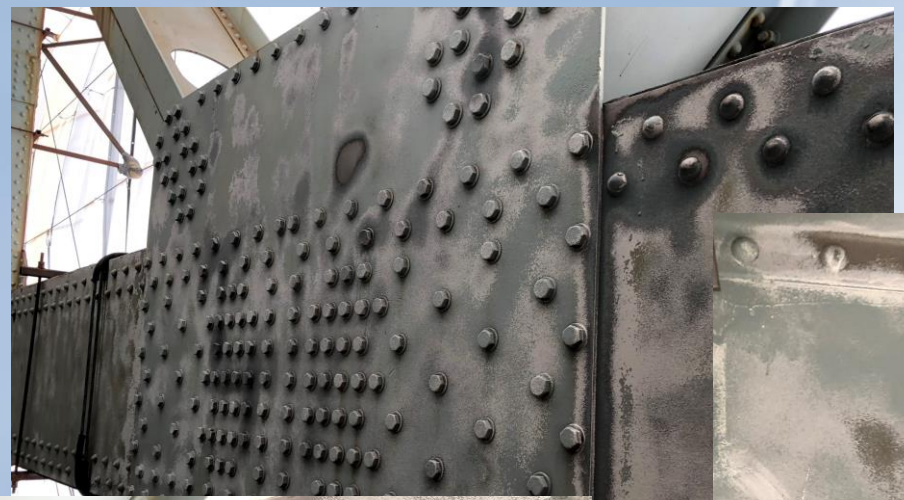
Cost Savings

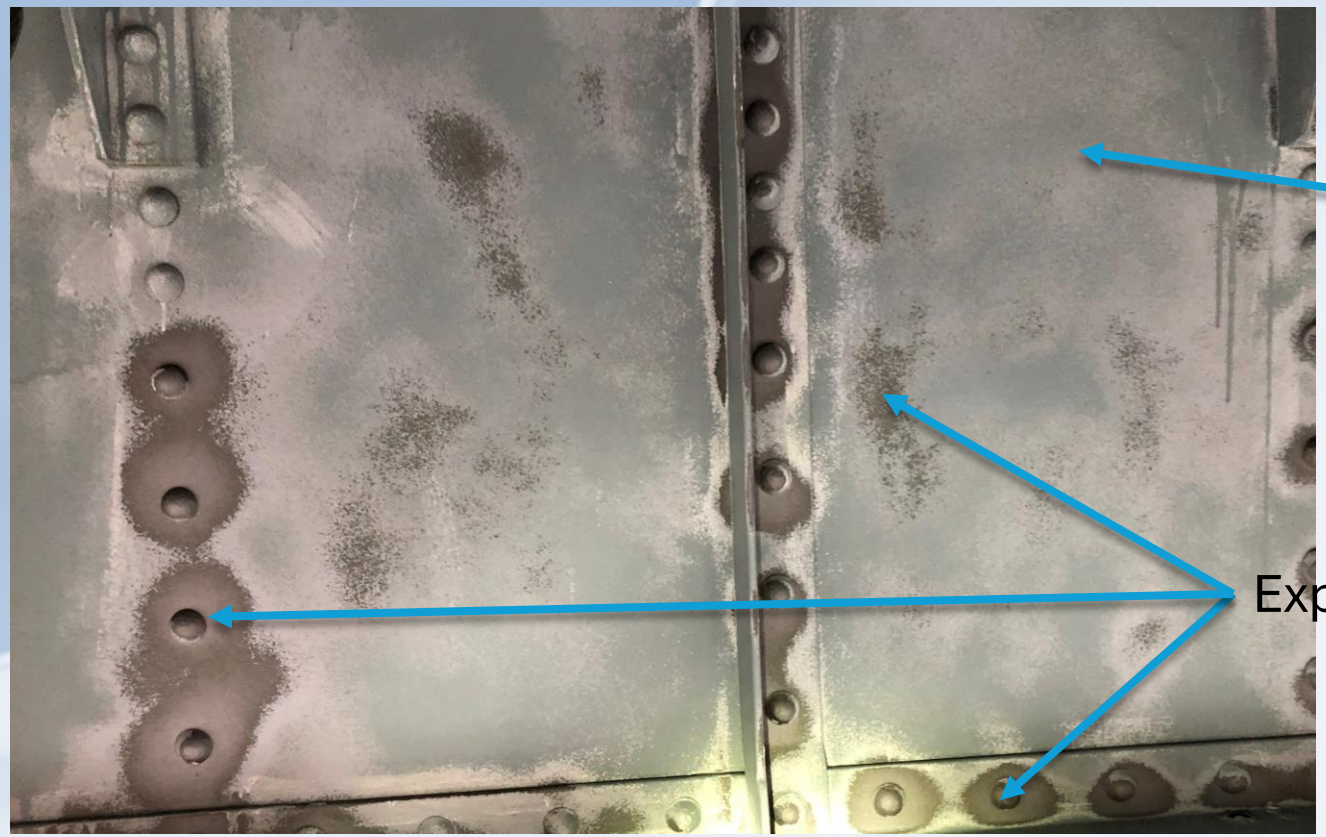
Surface Preparation	Nozzle-hours Savings	Schedule Days Savings	Basis
SP-10, Near White Blast	0%	0%	Zone 3
Navy Industrial Blast Cleaning	32%	19%	Zone 3 before "pickup" blast
Navy Spot and Sweep Cleaning	64%	57%	Zone 1

- Data above from ship tank demonstration
- Consistent with other demonstration observations that the second and third blast cycles represent approximately 50% of the cost and schedule
- If blasting represents 15% of re-preservation cost, moving to a partial blast could save 5-10% of the total re-preservation cost

Verrazzano Narrows Blast Demonstration



Thorough Spot and Sweep Blast Cleaning



Verrazano Narrows - Training Tools

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Prepared (L) and Coated (R)

Prepared (L) and Coated (R)

Prepared (L) and Coated (R)

Prepared (L) and Coated (R)

Prepared (L) and Coated (R)

Fall 2024 Condition (3-4 years in service)

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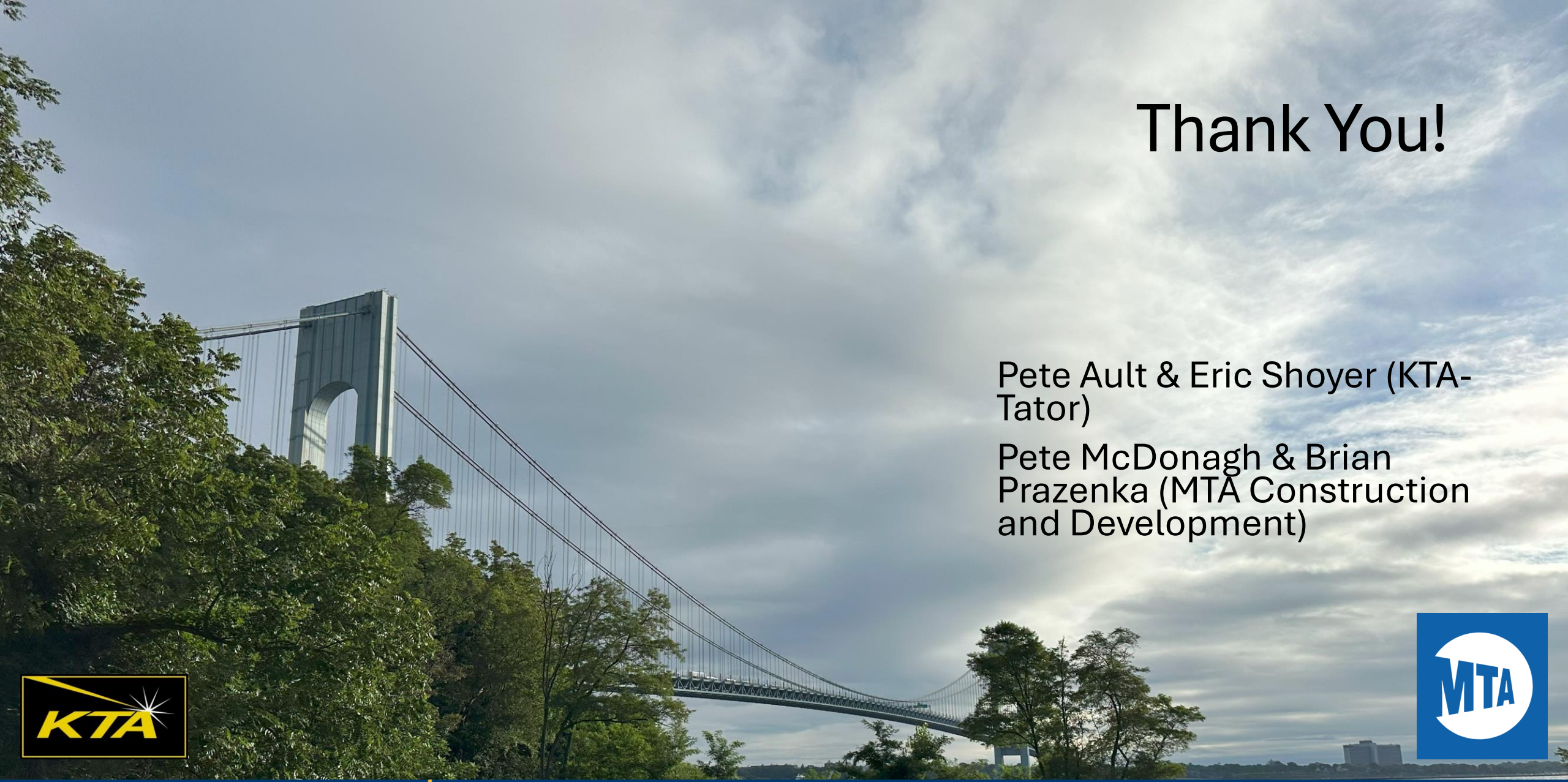
Conclusions

- The SP-18 approach is ideally suited for restoring high-performance coating systems
  - Zinc/epoxy/urethane coatingapplied in the mid-late 1990's (~20-30 years old)
  - Lead abatement is not a driver
  - Typically less than 3% rusted

Conclusions

- Based on the success of this project, MTA is using the SP-18 requirement on two other projects
  - Reduced lane closures, energy use, construction time
  - Arguably “better than new” performance
  - Significant serviceable coating remaining



Thank You!

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